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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/942,328	08/28/2001	Padmanabha I. Venkitakrishnan	HP-10008019-1	7710

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HEWLETT-PACKARD COMPANY  
Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, CO 80527-2400

EXAMINER

KIM, HONG CHONG

ART UNIT	PAPER NUMBER
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2186

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DATE MAILED: 07/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/942,328

Applicant(s)

VENKITAKRISHNAN ET AL.

Examiner

Hong C Kim

Art Unit

2186

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 11-21 is/are rejected.
- 7) ☒ Claim(s) 3-10 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

Art Unit: 2186

**Detailed Action**

1. Claims 1-21 are presented for examination. This office action is in response to the amendment filed on 4/22/04.

2. Applicants are reminded of the duty to disclose information under 37 CFR 1.56.

***Claim Rejections - 35 USC ' 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carpenter et al. (Carpenter) US Patent No. 6,115,804 in view of Cherabuddi US Patent Application Pub No. 2002/0184445 .

As to claim 11, Carpenter discloses the invention as claimed. Carpenter discloses a cache coherency system comprising: a plurality of cache memories (col. 3 lines 50-51) including a cache line for storing information; a plurality of processor cores (Fig. 10's) on a single substrate for processing instructions and information stored in said plurality of cache memories wherein one of said plurality of processor cores is coupled to and associated with one of said plurality

Art Unit: 2186

of cache memories; and a coherency system bus (col. 5 lines 3-5) for providing coherency in accordance with a memory coherency maintenance method, wherein said memory coherency maintenance method maintains coherency throughout a shared memory model including said plurality of cache memories. However, Carpenter does not specifically disclose a plurality of processor cores on a single substrate.

Cherabuddi discloses a plurality of processor cores on a single substrate (block4) for the purpose of providing capability of parallel processing and decreasing the size and power consumption and increasing the speed by decreasing the distance among the components.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a plurality of processor cores included on a single substrate as shown in Cherabuddi into the teaching of Carpenter thereby results in an invention as claimed.

5. Claims 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carpenter et al. (Carpenter) US Patent No. 6,115,804 in view of Parks US Patent No. 6,356,983.

As to claim 18, Carpenter discloses the invention as claimed. Carpenter discloses a cache coherency method comprising: invalidating said cache line; modifying said cache line; and sharing said cache line (Table VI). However, Carpenter does not specifically disclose pausing actions to a cache line. Parks discloses pausing actions to a cache line (col. 9 lines 55-60, cache miss, busy,

Art Unit: 2186

and pending reads on this limitation since those states need to pause or interrupt the current action to take next action) for the purpose of maintaining data consistency.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate pausing actions to a cache line of Parks in the teaching of Carpenter thereby results in an invention as claimed.

As to claim 19, Carpenter further discloses wherein said sharing a cache line includes a sharing control process further comprises: permitting internal reading of said cache line without shared bus activity; and producing a invalid cache line transaction when said cache line is internally written (Table VI).

As to claim 20, Parks further discloses producing an internal access line miss; and causing a processor core to fetch said cache line information from a on chip system bus (OCSB) (col. 2 lines 24+).

As to claim 21, Carpenter further discloses wherein modifying said cache line produces a modified cache line state and includes a more recent value than a main memory (Table VI).

6. Claims 1-2, and 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carpenter et al. (Carpenter) US Patent No. 6,115,804 in

Art Unit: 2186

view of Parks US Patent No. 6,356,983 and further in view of Cherabuddi US Patent Application Pub No. 2002/0184445 .

As to claim 1, Carpenter discloses the invention as claimed. Carpenter discloses a cache coherency maintenance system, comprising: a plurality of cache memories including a cache line for storing information (col. 3 lines 50-51); a plurality of processor cores (Fig. 10's) for processing instructions and information stored in said plurality of cache memories wherein one of said plurality of processor cores is coupled to and associated with one of said plurality of cache memories; and a coherency system bus (col. 5 lines 3-5) for communicating information between said plurality of cache memories and said plurality of processor cores in accordance with a coherency protocol, wherein said coherency protocol state with said cache line. However, Carpenter does not specifically disclose a pending state. Parks discloses a pending state (col. 9 lines 55-60) for the purpose of maintaining data consistency.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a pending state of Parks in the teaching of Carpenter thereby results in an invention as claimed.

However, neither Carpenter nor Parks specifically discloses a plurality of processor cores included on a single substrate.

Cherabuddi discloses a plurality of processor cores included on a single substrate (block4) for the purpose of providing capability of parallel processing and decreasing the size and power consumption and increasing the speed by decreasing the distance among the components.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a plurality of processor cores included on a single substrate as shown in Cherabuddi into the combined teaching of Carpenter and Parks thereby results in an invention as claimed.

As to claim 2, Parks further discloses wherein said pending state locks out access to said cache line when said cache line is in transition and continues to lock out access to said cache line until appropriate responses are received indicating continuation of a cache line transaction will not result in race conditions that cause information coherency problems (col. 3 lines 1-3 and col. 9 lines 50-60).

As to claim 12, Carpenter and Cherabuddi disclose the invention as claimed. Carpenter further discloses attempting to access information in a first memory (col. 9 lines 10-12); changing to a modify state; transitioning to an invalid state; and shifting to a shared state (Table VI). However, neither Carpenter nor Cherabuddi specifically discloses a pending state. Parks discloses a pending state (col. 9 lines 55-60) for the purpose of maintaining data consistency.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate a pending state of Parks in the combined teaching of Carpenter and Cherabuddi thereby results in an invention as claimed.

As to claim 13, Parks further discloses wherein said memory coherency maintenance method comprises a pending state that locks out access to information included in one of said plurality of caches while transitioning between other states (col. 3 lines 1-3 and col. 9 lines 50-60).

As to claim 14, Parks further discloses wherein one of said plurality of processors attempts to access information from an external cache (col. 2 lines 25-28).

As to claim 15, Carpenter further discloses wherein a modified state is entered in one of said plurality of cache memories and the information is put into an invalid state in the remaining of said plurality of cache memories (Table VI).

As to claim 16, Carpenter further discloses an embedded memory for storing information and data for downloading to said plurality of cache memories and utilization by said plurality of processors (col. 4 lines 29+).

As to claim 17, Carpenter further discloses wherein said cache line is in a shared state and comprises the same value as in said embedded main memory (Table VI).

***Allowable Subject Matter***



Art Unit: 2186

7. Claims 3-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See attached PTO-892.

9. a shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) days from the mail date of this letter. Failure to respond within the period for response will result in **ABANDONMENT** of the application (see 35 USC 133, MPEP 710.02, 710.02(b)).

10. Applicants are requested to number each line of each claim starting with line number one to provide easier communication in the future.

11. When responding to the office action, Applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or objections. See 37 C.F.R. ' 1.111(c).

12. When responding to the office action, Applicants are advised to

Art Unit: 2186

provide the examiner with the line numbers and page numbers in the application and/or references cited to assist examiner to locate the appropriate paragraphs.

13. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Hong Kim whose telephone number is (703) 305-3835. The Examiner can normally be reached on the weekdays from 8:30 AM to 5:00 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Matt Kim, can be reached on (703) 305-3821.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3900.

14. **Any response to this action should be mailed to:**

Commissioner of Patents and Trademarks  
Washington, D.C. 20231

**or faxed to TC-2100:**  
(703) 872-9306

Hand-delivered responses should be brought to Crystal Park II,  
2121 Crystal Drive, Arlington, VA., Sixth Floor (Receptionist).

HK  
Primary Patent Examiner  
July 11, 2004

